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ABSTRACT

The Alabama High School Graduation Examination (AHSGE) was given to eleventh graders for the first time in October 1983. In April, 1983, an instructional validity survey was conducted concurrently with the piloting of the AHSGE to determine if seventh, eighth, ninth, and tenth grade students were being taught the skills tested on the AHSGE. Teachers were asked to indicate what percentage of students were taught each skill identified in the AHSGE item specifications; students were asked if they had received instruction in each skill. The sample of schools used for the instructional validity survey was the same as that used for pilot testing the AHSGE. In the perception of teachers, there was a .95 probability that a student would have received instruction on each competency during the four-year span of grades 7-10. Similarly, in the students' perception, there was a .98 probability that he or she would have received instruction on each competency. (BW)

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Teacher/Student Perceptions of Minimum Competency Instruction

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Teacher/Student Perceptions of Minimum

Competency Instruction

Basic competency testing has become widespread in usage, if not in acceptance, among educators and the lay public. Grade level basic competency tests are utilized as a method of assuring an acquisition of at least a minimum level of student competence in such basic skills as reading, other language arts, and mathematics. In Alabama, "Basic Competency Tests have been developed to identify students who need remedial instruction to master basic minimal competencies and to help teachers identify competencies that need reinforcement or further instruction" (Alabama State Department of Education, 1982, p. 1). Since May, 1980, basic competency tests have been administered toward the end of the academic year in grades 3, 6, and 9 for the purpose of ascertaining basic skills competence in student achievement. An extension of these tests is the Alabama High School Graduation Examination (ASHGE) in grade 11 (Resolution adopted by the Alabama State Board of Education, May 19, 1981). This test was given for the first time in October, 1983. A student must pass the AHSGE as one criteria required for receiving a diploma upon graduation from high school. Institution of this sanction raises some serious professional, ethical, and

legal concerns with respect to use of the test scores (Debra P. v. Turlington, 474 F. Supp. 244 (M. D. Fla. 1979); Haney, 1983). In order to respond to such concerns, the State must be able to prove that its test and testing program are fair, valid, and essential to the education and evaluation of students in the State of Alabama (McClung, 1977 (a); Popham & Lindheim, 1981; Pullin, 1983).

In April, 1983, an instructional validity survey was conducted by an independent researcher concurrently with the piloting of the Alabama High School Graduation Examination prior to its actual administration in the fall of 1983. This survey was conducted to determine if 7th, 8th, 9th, and 10th grade students are being taught the skills tested on the AHSGE. The instructional validity survey is one important means of establishing whether students have received instruction in these skills. Teacher self-reports and student perceptions of instruction were analyzed to determine the following:

1. The probability that students will have received instruction in all identified competencies prior to taking the AHSGE;
2. The reasons competencies currently are not being taught in these grades if it is indicated that some are not being taught; and,

3. The comparison of students' reported perceptions of instruction of competencies with those of teacher self-reports.

Method

The instructional validity survey was composed of two surveys designed to obtain information from teachers and students relative to instruction in basic skills. The teacher survey form for each of the subject areas contains a list of the competencies as they are stated in the Reading, Language, Mathematics Item Specifications for the Alabama High School Graduation Examination (Bulletin 1983, No. 4). Each teacher involved in the study was provided a copy of the specification booklet and was asked to read each competency and its item specification to indicate: (a) what percentage of students (for a particular subject and specified grade level) were taught that skill at that grade level; (b) what percentage of students were not taught the skill at that grade level because it was too easy for them or previously had been mastered; and, (c) what percentage of students were not taught the skill at that grade level because it was too difficult. Teachers were asked to complete a separate survey form for each content area and grade level taught.

The student survey was designed with skills written in terms that could be read more easily by students with exam-

ples given from the item specifications as needed. The competencies were provided for the students in separate skill sets for each subject. Each student, however, was asked to respond to each of the three skills sets (reading, language, mathematics) in varying orders. The collation was employed as a counter-balancing mechanism for the possibility that a response set may account for a pattern of responses. For each skill the student was asked to answer the question, "Have you been taught this skill?", and to respond by marking one of the four columns provided to indicate: (a) Yes, you have been taught the skill this year; (b) Yes, you have been taught the skill but at an earlier grade; (c) Yes, you have been taught the skill at an earlier grade and have reviewed it this year; or (d) No, you have not been taught the skill.

The sample of schools used for the instructional validity survey was the same as that used for the pilot testing of the two forms of the AHSGE. These schools were selected using a stratified random sampling technique with achievement as the stratification variable. Teachers and students in grades 7, 8, 9, and 10 were surveyed. Within these schools and grades, the sample of teachers was composed of all teachers who were directly responsible for instruction of reading, language, and/or mathematics skills. The student

sample was drawn from English class rolls by selecting every fourth student (who was actually enrolled) on each class roll.

The survey was administered whenever feasible by school professionals other than the reading, language, or mathematics teachers in the selected grades. Identified students for each grade level were given the survey in a central location at the beginning of a school day. In most cases, actual administration took approximately 20 minutes. Upon completion, the surveys were collected, identified by grade level and school name for packaging, and returned directly to the researcher. Of the survey responses received, 94% were consistent with survey directions. The actual sample analyzed included 995 teacher responses (312 reading, 325 language, 358 mathematics) and 6,337 student responses.

A Statistical Analysis System (SAS) program was written to create separate data sets of both student and teacher responses by grade level and content area. Summarizing statistics were performed on the raw data to obtain frequency counts of both teacher and student responses to each competency in each content area.

Teacher data were analyzed to obtain estimates of the proportion of students who received instruction on each competency using the formula

$$P_{7\text{-}10} = 1-[(1-P_{7})(1-P_{8})(1-P_{9})(1-P_{10})]$$

where P_7, P_8, P_9, and P_{10} are average proportions of students receiving instruction on a competency at each respective grade; and $P_{7\text{-}10}$ is the proportion of students who have received instruction on a competency during the four-year span of grades 7 - 10 (ETS, 1982). This was accomplished by first obtaining a probability for each competency at each grade level that a student would not have received instruction ($1-P_7$, etc.). The product of these probabilities across the four grade levels was then calculated. Assuming random assignment of students to classes within grade levels, the difference between that product and 1 yields the teachers' perception probability that a student would have received instruction on a particular competency at some time during the four-year span of grades 7 - 10. Similarly, this index of probability was applied to the "Not taught" results of student frequencies of responses which were converted to proportions of students who said they had not been taught the competency. The difference between the product of these proportions across grade levels and 1 yields a students' perception probability that they will be taught the competency during the four-year span of grades 7 - 10.

Because of homogeneity considerations, it was necessary to analyze the competency data as three data sets: reading, language, and mathematics. Within each data set, however, it was assumed that there was sufficient homogeneity to analyze all items of each separate data set simultaneously. The procedure chosen for these analyses was multiple analysis of variance (MANOVA). The MANOVA hypotheses were tested at the .05 level of significance for six independent variables:

1. school system, SYSCODE;
2. school within school system, SCHCODE(SYSCODE);
3. grade, GRADE;
4. type of response (teacher or student), TYPEREC;
5. order of content area as encountered in student survey, xORDER(TYPEREC); and,
6. grade by type of response, GRADE*TYPEREC

Application of the technique produced three statistics for considering the evidence of systematic differences among the variables: Hotelling-Lawley Trace, Pillai's Trace, Wilks' Criterion.

Finding from the MANOVA that there were significant differences, it was appropriate to execute univariate analyses of variance (ANOVA) (.001 level of significance), and Scheffe' post hoc analyses to delineate significant differences at the .0001 level. This procedure was applied subsequently to all identified variables. The specific

findings were based on the means of teacher and student data expressed in proportions.

(When considering the results of the post hoc analyses, it should be noted that the Scheffe' test looks at the variables in a pairwise manner, only. That is, for example, one system is paired against another system. In no way does the Scheffe' test, as computed for this report, combine systems to compare with other systems or combinations of systems. ANOVA, however, identifies differences for all possible comparisons for each independent variable. When compared in this manner, there may not be enough difference between the levels of an independent variable to show a "significant" difference for a particular competency in the post hoc analyses. In other words, MANOVA might generate significance for some independent variable that would not be significant with some ANOVA, and if significant with ANOVA, might not be significant on the post hoc Scheffe' tests reported.)

Results

From the indices of probability that a student will have received instruction on each competency during the four-year span of grades 7 - 10, in the perception of teachers, none of the 62 competencies surveyed yielded a probability below 0.95. Only fifteen percent of the competencies yielded probabilities in the range of 0.95 through 0.98. (See Table 1.) Similarly, in the students' perception, the same proce-

dure yielded only one competency with a probability below 0.99. Language Competency VI-1, Complete a common form such as a driver's license application or a change of address form, had a 0.98 index of probability for instruction in grades 7 - 10.

From examination of the frequencies of student survey responses, it was noted that Column 4 (Not taught) for each grade in Table 2 (reading), Table 3 (language), and Table 4 (mathematics) revealed the percentage of students who indicated they had not been taught each competency. Beginning with the 7th grade and looking at this percentage through the 10th grade for the three content areas, the instructional validity survey findings detect inconsistencies in instruction as reported by students.

For reading, percentages of students not taught decreased for all competencies with the exceptions of III-1, Determine word meanings from a knowledge of prefixes and suffixes; IV-5, Know the uses of the different sections of the newspaper; and V-1, Follow directions and instructions. It was noted that the percentage not taught (Table 2) increased for grade 8 on Competency III-1 and for grade 9 on Competency V-1; however, in both cases, the 10th grade percentage of students not taught these competencies was lower than that of the 7th grade. The percentage of students not taught Competency IV-5, on the other hand, decreased from

grade 7 through 9, then increased by 4% from grade 9 to grade 10. This indicated that 18% of the 10th grade students surveyed believed they had not been taught the uses of the different sections of a newspaper.

Similar examination of responses to language competencies (Table 3) revealed that percentages of students not taught decreased from grades 7 through 10 for all but four competencies: IV-1, Include in a message or request all necessary information; IV-2, Determine what information is missing or irrelevant from a message, an announcement, or a process explanation; VIII-2, Identify the comma to separate words in a series; and, VIII-4, Identify an apostrophe to show the possessive of singular and plural nouns. Of these competencies, only IV-1 and IV-2 actually increased for grade 10: an increase of 1% over grade 9 for Competency IV-1 and an increase of 3% over grade 9 for Competency IV-2.

Of the 29 mathematics competencies surveyed (Table 4), two competencies failed to show a consistent decrease in percentage of students taught across grades 7 - 10. Competency V-1,3, Recognize simple plane geometric figures and parallel and perpendicular lines, had reported 5%, 3%, 4%, and 5% for grades 7, 8, 9, and 10 respectively. Competency V-2, Recognize common solid geometric figures, showed an increase of 2% of 10th grade students over 7th

grade students who said they had not been taught the competency.

Further analysis of the tables of student frequency of responses reveals that 10% or more of the 1983, 10th grade students surveyed indicated they had not been taught four reading, three language, and six mathematics competencies. These are outlined in Table 5.

Another area of inquiry for this study dealt with reasons competencies were not taught if it was indicated that some were not being taught at the time of the survey. Close examination of the 75 - 99% category of teacher frequencies of response for grades 7 through 10 (Tables 18, 19, and 20), revealed that there were discrepancies in teachers' reasons for not teaching particular competencies. For example, when attention was focused on row (b), Not taught because previously mastered, and row (c), Not taught because too difficult, of Table 18 for Competency IV-9,10,11, it was noted that 11 of the 10th grade reading teachers surveyed reported they did not teach that competency to 75 - 99% of their students because it was too easy or previously mastered. On the other hand, 8 of the 10th grade reading teachers surveyed said they did not teach it because it was too difficult. Reading Competencies I-1,2,IV-13, IV-3, 5, 8, 14; and VI-1 show similar discrepancies for the 10th grade. Examination of Table 19 for percentages of students taught

language competencies revealed discrepancies between teachers' reasons for not teaching Competencies II-2; V-1, 2; and VI-1. Likewise, from Table 20, slight discrepancies were noted for Competencies I-10; II-1, 2, 3, 4, 5; III-1, 3; V-1,3, 2; and VI-5, 6. These findings indicate that as a result of lack of instruction (for whatever reason), there were teachers who reported that they did not teach particular competencies.

Application of the MANOVA to each of the data sets resulted in significance for four of the six identified independent variables: SYSCODE, SCHCODE(SYSCODE), GRADE, and TYPEREC. (See Tables 6, 10, 14.) From the subsequent univariate ANOVA (Tables 7, 11, 15) and post hoc analyses (Tables 8, 9, 12, 13, 16, 17), it was concluded that only two variables, GRADE and TYPEREC maintained significance at the .0001 level for a substantial number of competencies from each data set.

Discussion

The results of the survey indicate an improving trend toward ensuring that all Alabama students have received instruction on all basic competencies. The inception of checkpoint competency tests in grades 3, 6, and 9 has resulted in students receiving remediation on those competencies that they have not mastered before proceeding to more complex competencies. Indicative of this emphasis, the

survey shows a high probability that all competencies will have been taught prior to students reaching 11th grade and taking the AHSGE. Not surprising, however, is the fact that teachers across all grades surveyed are more confident that they are teaching the competencies than the students are confident that they have been taught the competencies. This, in part, may be a function of students' knowledge of what a specific competency statement means rather than actual exposure to instruction on the competency. Also, any statements based on these analyses necessarily assumed that the teachers were responding as accurately as possible. The possibility existed that since instruction on these competencies was "required" of teachers, they were reluctant to admit that, for some reason, they did not teach 100% of the competencies to 100% of the students. In the case of mathematics, it should be noted, additionally, that prior to the 1982-1983 school year, only one year of mathematics was required for graduation from Alabama public schools, whereas, two years are required presently. There were many 10th grade students in the spring of 1983 who currently were not taking mathematics and, consequently, may have forgotten that they ever received instruction on these competencies.

The percentage of students indicating they have been taught the competencies tends to increase the higher the grade. Tenth grade students, therefore, are generally more

confident that they have been taught the competencies than are students in grades 7, 8, or 9. The specific competencies which 10th grade students seemed to be less confident they had been taught are, for the most part, life skills or functional literacy skills. It was assumed that these competencies had not received emphasis in the curriculum long enough for all 10th grade students to have received such instruction. It was further assumed that as the basic skills curriculum becomes more in place, instances of lack of instruction and lack of confidence in having been taught the skills will decrease.

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APPENDIX

Table 1

Competencies with Probabilities of Instruction
Below 0.99 as Reported by Teachers

Content Area		Competency	Index of Probability
Reading	IV-5	Know the uses of the different sections of the newspaper	0.98
Reading	IV-9,10,11	Determine main idea and detail from selected material on government, law, money management, health, and nutrition	0.98
Language	VI-1	Complete a common form such as a driver's license application or change of address form	0.96
Math	III-3	Interpret scale drawings	0.98
Math	VI-1	Determine change	0.97
Math	VI-3	Compare the cost of cash and credit purchases	0.97
Math	VI-4	Allocate time and money	0.97
Math	VI-5	Complete checks and money orders	0.95
Math	VI-7	Compute salaries and wages	0.98

Table 2

Reading Student Frequencies of Responses to Instruction of Competencies by Grade Level* and Column of Response**
(Expressed in Percentages)

Competency	Grade Level/Column of Response							
	7				8			
	1	2	3	4	1	2	3	4
I-1,2;IV-13	25	16	23	34	26	20	26	27
II-1	33	20	42	4	28	20	47	4
III-1	24	23	48	3	20	30	44	5
III-2	21	22	54	2	17	29	50	2
IV-1	18	32	46	3	14	37	45	2
IV-3	23	24	47	5	19	32	45	4
IV-4	23	28	46	3	17	36	44	2
IV-5	18	31	18	32	21	31	20	28
IV-6	24	19	40	15	24	19	46	10
IV-7	27	16	49	6	28	18	47	5
IV-8	24	21	46	8	21	27	46	6
IV-9,10,11	21	16	23	338	29	17	29	24
IV-14	18	33	22	224	16	36	24	22
V-1	15	22	59	2	16	23	57	2
VI-1	20	22	49	6	22	24	46	6

Table 2, Reading Student Frequencies (%) - Continued

Competency	Grade Level/Response Column							
	9				10			
	1	2	3	4	1	2	3	4
I-1,2;IV-13	26	25	34	14	22	35	31	11
II-1	21	27	49	2	21	31	45	2
III-1	16	40	40	3	14	47	35	2
III-2	17	30	51	1	15	43	40	1
IV-1	12	42	44	1	13	45	40	1
IV-3	18	32	47	2	15	37	45	2
IV-4	15	37	46	2	15	44	40	1
IV-5	20	41	25	14	10	52	20	18
IV-6	18	22	52	6	19	30	46	4
IV-7	20	25	51	4	18	33	46	3
IV-8	15	32	47	5	11	46	37	5
IV-9,10,11	15	28	33	23	17	32	31	20
IV-14	13	44	26	15	10	51	22	14
V-1	11	30	54	2	14	35	48	1
VI-1	14	33	44	6	16	40	37	5

* 7th grade n = 1696
8th grade n = 1503
9th grade n = 1529
10th grade n = 1547

** Column 1 = Taught at this grade level
Column 2 = Taught at an earlier grade
Column 3 = Taught at an earlier grade and reviewed this year
Column 4 = Not taught

Table 3

Language Student Frequencies of Responses to Instruction of Competencies by Grade Level* and Column of Response** (Expressed in Percentages)

Competency	Grade Level/Column of Response							
	7				8			
	1	2	3	4	1	2	3	4
I-1	37	9	26	28	41	11	28	18
I-2	28	8	62	1	27	10	62	1
II-1	21	20	39	19	21	26	39	13
II-2	28	18	46	7	27	20	48	5
II-3	19	23	29	28	18	28	29	22
IV-1	32	20	39	8	30	19	41	8
IV-2	27	23	28	21	24	24	29	21
V-1	25	27	38	7	24	30	41	4
V-2	24	31	42	2	21	32	42	2
VI-1	16	16	15	51	23	18	14	44
VII-1	25	20	44	10	24	22	46	7
VIII-1	20	13	64	1	19	13	67	1
VIII-2	24	12	59	3	23	11	64	1
VIII-3	26	16	52	5	25	11	59	4
VIII-4	25	12	57	4	23	17	57	2

Table 3, Language Student Frequencies (%) - Continued

Competency	Grade Level/Response Column							
	7				8			
	1	2	3	4	1	2	3	4
VIII-5	26	16	50	7	25	15	54	5
VIII-6	31	17	30	20	28	17	39	15
IX-1	20	17	60	2	17	18	63	1

Table 3, Language Student Frequencies (%) - Continued

Competency	Grade Level/Response Column							
	9				10			
	1	2	3	4	1	2	3	4
I-1	35	14	38	11	31	17	43	7
I-2	21	10	68	0	21	13	65	0
II-1	14	28	45	11	15	30	46	8
II-2	22	20	53	3	21	24	53	2
II-3	14	34	36	15	14	38	31	15
IV-1	22	26	45	6	20	32	39	7
IV-2	20	29	39	10	15	42	28	13
V-1	19	22	54	2	21	30	46	2
V-2	18	24	55	1	19	33	46	1
VI-1	23	24	22	29	17	32	24	25
VII-1	18	23	51	6	19	29	47	4
VIII-1	14	19	65	0	16	22	61	0
VIII-2	16	16	65	2	18	18	62	1
VIII-3	19	17	60	3	17	20	60	2
VIII-4	17	22	56	3	16	26	55	3

Table 3, Language Student Frequencies (%) - Continued

Competency	Grade Level/Response Column							
	9				10			
	1	2	3	4	1	2	2	4
VIII-5	19	22	54	3	18	22	57	2
VIII-6	23	21	45	9	21	24	47	7
IX-1	14	23	60	1	16	25	58	1

* 7th grade n = 1713
8th grade n = 1514
9th grade n = 1548
10th grade n = 1562

** Column 1 = Taught at this grade level
Column 2 = Taught at an earlier grade
Column 3 = Taught at an earlier grade; reviewed this year
Column 4 = Not taught

Table 4

Mathematics Student Frequencies of Responses to Instruction of Competencies by Grade Level* and Column of Response** (Expressed in Percentages)

Competency	Grade Level/Column of Response							
	7				8			
	1	2	3	4	1	2	3	4
I-1	16	27	[illegible]	5	12	40	41	4
I-2	37	7	49	4	25	12	59	2
I-3	19	12	66	0	15	16	66	1
I-4	32	6	58	1	19	11	67	1
I-5	31	7	60	1	21	9	67	1
I-6	60	4	30	4	35	8	53	1
I-7	60	4	16	19	52	8	31	8
I-8	53	5	33	7	36	8	50	4
I-9	37	10	38	13	31	14	44	9
I-10	30	15	39	13	26	20	43	9
II-1	26	20	44	8	24	23	44	7
II-2	21	25	50	3	15	33	47	3
II-3	25	24	32	17	22	24	38	14
II-4	37	11	36	14	31	11	48	8
II-5	38	13	39	7	35	10	48	4
III-1	28	15	33	21	26	17	42	12
III-2	23	17	34	23	24	19	43	12

Table 4, Mathematics Student Frequencies (%) - Continued

Competency	Grade Level/Response Column							
	7				8			
	1	2	3	4	1	2	3	4
III-3	22	16	21	38	22	19	29	27
IV-1	24	12	56	5	21	15	57	4
IV-2	27	12	31	27	27	15	33	22
V-1,3	26	14	51	5	23	19	51	3
V-2	26	20	43	7	25	21	45	5
VI-1	23	19	49	5	17	24	52	4
VI-2	30	16	24	26	28	19	30	19
VI-3	24	13	21	38	23	17	24	32
VI-4	23	17	23	33	21	19	26	31
VI-5	25	15	17	39	21	23	23	30
VI-6	35	12	26	22	34	12	37	14
VI-7	26	9	17	44	27	12	25	33

Table 4, Mathematics Student Frequencies (%) - Continued

Competency	Grade Level/Response Column							
	9				10			
	1	2	3	4	1	2	3	4
I-1	9	49	38	3	8	60	28	2
I-2	16	27	54	2	12	40	44	1
I-3	11	31	57	0	11	37	49	0
I-4	12	27	60	0	12	33	53	0
I-5	13	21	65	0	11	29	57	0
I-6	18	19	60	1	14	30	53	1
I-7	32	17	46	4	24	29	40	4
I-8	19	21	56	2	15	31	51	2
I-9	18	29	49	4	13	37	44	4
I-10	20	29	46	4	14	38	42	3
II-1	23	26	46	4	20	35	41	3
II-2	12	42	44	2	8	58	30	2
II-3	15	37	37	9	12	47	30	8
II-4	21	19	53	7	17	30	46	6
II-5	20	20	55	4	18	30	47	4
III-1	21	19	48	11	16	32	43	7
III-2	17	24	47	10	15	33	42	8
III-3	17	27	33	22	13	38	27	20

Table 4, Mathematics Student Frequencies (%) - Continued

Competency	Grade Level/Response Column							
	9				10			
	1	2	3	4	1	2	3	4
IV-1	13	32	52	2	12	35	49	2
IV-2	20	26	37	16	15	38	32	13
V-1,3	16	35	43	4	17	35	40	5
V-2	15	37	39	6	17	38	34	9
VI-1	16	33	47	2	14	42	39	2
VI-2	20	30	35	13	16	41	29	11
VI-3	22	26	29	22	17	36	27	17
VI-4	21	30	27	20	15	40	23	19
VI-5	27	26	35	9	20	37	33	7
VI-6	32	16	43	7	21	31	40	5
VI-7	28	20	35	15	22	32	32	11

* 7th grade n = 1711
8th grade n = 1512
9th grade n = 1540
10th grade n = 1556

** Column 1 = Taught at this grade level
Column 2 = Taught at an earlier grade
Column 3 = Taught at an earlier grade; reviewed this year
Column 4 = Not taught

Table 5

Competencies Reported as Not Taught by More Than 10% of 1983, 10th Grade Students

Content Area		Competency	Percentage
Reading	I-1,2;IV-13	Associate selected written words and phrases with their literal meanings; recognize and use various forms and application blanks used in everyday life	11
	IV-5	Know the uses of the different sections of a newspaper	18
	IV-9,10,11	Determine main idea and detail from selected material on government, law, money management, health, and nutrition	19
	IV-14	Follow directions and instructions	14
Language	I-3	Arrange written directions in logical order	14
	IV-2	Determine what information is missing or irrelevant from a message, an announcement, or a process explanation	13
	VI-1	Complete a common form such as a driver's license application or change of address form	24

Table 5, Competencies Not Taught - Continued

Content Area		Competency	Percentage
Math	III-3	Interpret scale drawings	18
	IV-2	Select reasonable answers	12
	VI-2	Use comparative shopping skills	11
	VI-3	Compare the cost of cash and credit purchases	17
	VI-4	Allocate time and money	19
	VI-7	Compute salaries and wages	11

Table 6

Multiple Analyses of Variance for Transformed Reading Competencies

Hotelling-Lawley Trace

	F approx.	df	p
Syscode	2.37	555,3707	0.0001
Schcode(Syscode)	2.03	510,3707	0.0001
Grade	3.31	45,743	0.0001
Typerec	21.12	15,249	0.0001
Rorder(Typerec)	0.97	30,496	0.5068
Grade*Typerec	2.14	45,743	0.0001

Pillai's Trace

	F approx.	df	p
Syscode	2.09	555,3945	0.0001
Schcode(Syscode)	1.84	510,3945	0.0001
Grade	3.15	45,753	0.0001
Typerec	21.12	15,249	0.0001
Rorder(Typerec)	0.98	30,500	0.5013
Grade*Typerec	2.04	45,753	0.0001

Wilks' Criterion

	F approx.	df	p
Syscode	2.23	555,3531	0.0001
Schcode(Syscode)	1.94	510,3485	0.0001
Grade	3.23	45,740	0.0001
Typerec	21.12	15,249	0.0001
Rorder(Typerec)	0.98	30,498	0.5040
Grade*Typerec	2.09	45,740	0.0001

Table 7

Analyses of Variance for Transformed Reading Competencies (RCOMPs)

Dependent Variable	Source	df	Type III SS	F Value	p
RCOMP1	Syscode	37	5.56	2.62	0.0001
	Schcode(Syscode)	34	4.12	2.11	0.0006
	Grade	3	0.78	4.54	0.0042
	Typerec	1	3.60	62.72	0.0001
	Rorder(Typerec)	2	0.21	1.85	0.1598
	Grade*Typerec	3	0.02	0.10	0.9548
	Error	263	15.11		
	Total	343	30.60		
RCOMP2	Syscode	37	1.72	2.92	0.0001
	Schcode(Syscode)	34	1.62	1.89	0.0032
	Grade	3	0.10	1.34	0.2616
	Typerec	1	2.17	86.12	0.0001
	Rorder(Typerec)	2	0.10	1.92	0.1484
	Grade*Typerec	3	0.17	2.27	0.0793
	Error	263	6.64		
	Total	343	13.21		
RCOMP3	Syscode	37	3.48	2.27	0.0001
	Schcode(Syscode)	34	3.09	2.19	0.0003
	Grade	3	0.46	3.72	0.0120
	Typerec	1	4.63	111.59	0.0001
	Rorder(Typerec)	2	0.04	0.46	0.6324
	Grade*Typerec	3	0.30	2.42	0.0653
	Error	263	10.91		
	Total	343	23.25		
RCOMP4	Syscode	37	5.49	2.84	0.0001
	Schcode(Syscode)	34	3.42	1.93	0.0024
	Grade	3	0.98	6.28	0.0005
	Typerec	1	0.33	6.40	0.0120
	Rorder(Typerec)	2	0.13	1.21	0.3003
	Grade*Typerec	3	0.06	0.40	0.7542
	Error	263	13.73		
	Total	343	24.25		

Table 7, ANOVA for Transformed RCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
RCOMP5	Syscode	37	4.43	2.00	0.0010
	Schcode(Syscode)	34	3.07	1.51	0.0412
	Grade	3	0.24	1.35	0.2588
	Typerec	1	2.60	43.43	0.0001
	Rorder(Typerec)	2	0.11	0.90	0.4061
	Grade*Typerec	3	0.03	0.16	0.9200
	Error	263	15.75		
	Total	343	26.74		
RCOMP6	Syscode	37	2.79	1.32	0.1125
	Schcode(Syscode)	34	3.74	1.92	0.0024
	Grade	3	0.17	1.01	0.3898
	Typerec	1	1.03	18.07	0.0001
	Rorder(Typerec)	2	0.09	0.81	0.4452
	Grade*Typerec	3	0.35	2.01	0.1110
	Error	263	15.05		
	Total	343	23.66		
RCOMP7	Syscode	37	5.27	2.39	0.0001
	Schcode(Syscode)	34	4.13	2.04	0.0010
	Grade	3	0.39	2.20	0.0867
	Typerec	1	1.32	22.12	0.0001
	Rorder(Typerec)	2	0.23	1.98	0.1407
	Grade*Typerec	3	0.13	0.75	0.5246
	Error	263	15.67		
	Total	343	27.68		
RCOMP8	Syscode	37	8.15	2.59	0.0001
	Schcode(Syscode)	34	5.25	1.82	0.0052
	Grade	3	1.16	4.56	0.0041
	Typerec	1	3.17	37.29	0.0001
	Rorder(Typerec)	2	0.11	0.64	0.5266
	Grade*Typerec	3	0.12	0.48	0.6999
	Error	263	22.34		
	Total	343	40.98		
RCOMP9	Syscode	37	4.36	3.33	0.0001
	Schcode(Syscode)	34	1.76	1.46	0.0539
	Grade	3	0.34	3.19	0.0239
	Typerec	1	3.39	95.97	0.0001
	Rorder(Typerec)	2	0.01	0.14	0.8674
	Grade*Typerec	3	0.05	0.43	0.7386
	Error	263	9.30		
	Total	343	18.77		

Table 7, ANOVA for Transformed RCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
RCOMP10	Syscode	37	3.16	2.97	0.0001
	Schcode(Syscode)	34	2.66	2.72	0.0001
	Grade	3	0.24	2.75	0.0425
	Typerec	1	1.85	64.45	0.0001
	Rorder(Typerec)	2	0.00	0.06	0.9444
	Grade*Typerec	3	0.54	6.28	0.0005
	Error	263	7.55		
	Total	343	16.10		
RCOMP11	Syscode	37	5.91	2.49	0.0001
	Schcode(Syscode)	34	2.85	1.31	0.1283
	Grade	3	1.32	6.85	0.0002
	Typerec	1	0.66	10.25	0.0015
	Rorder(Typerec)	2	0.16	1.26	0.2867
	Grade*Typerec	3	0.08	0.42	0.7439
	Error	263	16.88		
	Total	343	29.45		
RCOMP12	Syscode	37	7.02	2.38	0.0001
	Schcode(Syscode)	34	4.29	1.58	0.0260
	Grade	3	1.63	6.83	0.0002
	Typerec	1	0.61	7.70	0.0059
	Rorder(Typerec)	2	0.26	1.60	0.2034
	Grade*Typerec	3	0.95	3.99	0.0085
	Error	263	20.98		
	Total	343	34.71		
RCOMP13	Syscode	37	7.88	2.77	0.0001
	Schcode(Syscode)	34	3.49	1.33	0.1101
	Grade	3	0.78	3.39	0.0185
	Typerec	1	4.73	61.58	0.0001
	Rorder(Typerec)	2	0.10	0.67	0.5131
	Grade*Typerec	3	0.34	1.51	0.2120
	Error	263	20.21		
	Total	343	37.35		
RCOMP14	Syscode	37	2.14	2.52	0.0001
	Schcode(Syscode)	34	1.78	2.28	0.0002
	Grade	3	0.09	1.35	0.2585
	Typerec	1	3.88	169.15	0.0001
	Rorder(Typerec)	2	0.01	0.13	0.8782
	Grade*Typerec	3	0.08	1.20	0.3082
	Error	263	6.03		
	Total	343	13.83		

Table 7, ANOVA for Transformed RCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
RCOMP15	Syscode	37	5.73	3.72	0.0001
	Schcode(Syscode)	34	2.67	1.89	0.0032
	Grade	3	0.28	2.24	0.0826
	Typerec	1	3.08	73.82	0.0001
	Rorder(Typerec)	2	0.02	0.26	0.7698
	Grade*Typerec	3	0.03	0.21	0.8851
	Error	263	10.96		
	Total	343	22.99		

Table 8

Post Hoc Contrasts for Transformed Reading Competencies by Levels of Grade

RCOMP1	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	9 - 10	-0.00260	0.10085	0.20430
***	9 - 8	0.01849	0.12164	0.22479
***	9 - 7	0.04625	0.14882	0.25138
	10 - 9	-0.20430	-0.10085	0.00260
	10 - 8	-0.08236	0.02079	0.12394
	10 - 7	-0.05460	0.04797	0.15053
***	8 - 9	-0.22479	-0.12164	-0.01849
	8 - 10	-0.12394	-0.02079	0.08236
	8 - 7	-0.07508	0.02718	0.12944
***	7 - 9	-0.25138	-0.14882	-0.04625
	7 - 10	-0.15053	-0.04797	0.05460
	7 - 8	-0.12944	-0.02718	0.07508

(MSE = .057452)

Table 8, Reading Post Hoc Contrasts by Grade - Continued

	RCOMP3 Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Lower Confidence Limit
	7 - 8	-0.04142	0.04548	0.13238
***	7 - 9	0.02488	0.11204	0.19920
***	7 - 10	0.04712	0.13428	0.22145
	8 - 7	-0.13238	-0.04548	0.04142
	8 - 9	-0.02110	0.06656	0.15422
***	8 - 10	0.00114	0.08880	0.17646
***	9 - 7	-0.19920	-0.11204	-0.02488
	9 - 8	-0.15422	-0.06656	0.02110
	9 - 10	-0.06567	0.02225	0.11016
***	10 - 7	-0.22145	-0.13428	-0.04712
***	10 - 8	-0.17646	-0.08880	-0.00114
	10 - 9	-0.11016	-0.02225	0.06567

(MSE = .0414924)

	RCOMP4			
	7 - 9	-0.06990	0.02787	0.12564
	7 - 8	-0.01088	0.08660	0.18408
***	7 - 10	0.04749	0.14526	0.24303
	9 - 7	-0.12564	-0.02787	0.06990
	9 - 8	-0.03960	0.05873	0.15705
***	9 - 10	0.01878	0.11739	0.21600
	8 - 7	-0.18408	-0.08660	0.01088
	8 - 9	-0.15705	-0.05873	0.03960
	8 - 10	-0.03966	0.05866	0.15699
***	10 - 7	-0.24303	-0.14526	-0.04749
***	10 - 9	-0.21600	-0.11739	-0.01878
	10 - 8	-0.15699	-0.05866	0.03966

(MSE = .0522044)

Table 8, Reading Post Hoc Contrasts by Grade - Continued

	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
RCOMP7				
	7 - 8	-0.02965	0.07450	0.17865
	7 - 9	-0.02453	0.07993	0.18440
***	7 - 10	0.01504	0.11950	0.22397
	8 - 7	-0.17865	-0.07450	0.02965
	8 - 9	-0.09962	0.00543	0.11049
	8 - 10	-0.06005	0.04500	0.15006
	9 - 7	-0.18440	-0.07993	0.02453
	9 - 8	-0.11049	-0.00543	0.09962
	9 - 10	-0.06579	0.03957	0.14493
***	10 - 7	-0.22397	-0.11950	-0.01504
	10 - 8	-0.15006	-0.04500	0.06005
	10 - 9	-0.14493	-0.03957	0.06579
	(MSE = .0595971)			
RCOMP8				
	9 - 8	-0.04476	0.08067	0.20610
***	9 - 10	0.01456	0.14036	0.26616
***	9 - 7	0.01874	0.14346	0.26818
	8 - 9	-0.20610	-0.08067	0.04476
	8 - 10	-0.06575	0.05969	0.18512
	8 - 7	-0.06156	0.06279	0.18715
***	10 - 9	-0.26616	-0.14036	-0.01456
	10 - 8	-0.18512	-0.05969	0.06575
	10 - 7	-0.12162	0.00310	0.12783
***	7 - 9	-0.26818	-0.14346	-0.01874
	7 - 8	-0.18715	-0.06279	0.06156
	7 - 10	-0.12783	-0.00310	0.12162
	(MSE = .0849585)			

Table 8, Reading Post Hoc Contrasts by Grade - Continued

	RCOMP10 Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	8 - 9	-0.03410	0.03884	0.11177
	8 - 7	-0.01510	0.05721	0.12952
***	8 - 10	0.00369	0.07662	0.14956
	9 - 8	-0.11177	-0.03884	0.03410
	9 - 7	-0.05415	0.01837	0.09089
	9 - 10	-0.03536	0.03779	0.11094
	7 - 8	-0.12952	-0.05721	0.01510
	7 - 9	-0.09089	-0.01837	0.05415
	7 - 10	-0.05311	0.01942	0.09194
***	10 - 8	-0.14956	-0.07662	-0.00369
	10 - 9	-0.11094	-0.03779	0.03536
	10 - 7	-0.09194	-0.01942	0.05311

(MSE = .0287252)

	RCOMP11			
	7 - 8	-0.04390	0.06418	0.17226
	7 - 9	-0.01525	0.09316	0.20156
***	7 - 10	0.12817	0.23657	0.34498
	8 - 7	-0.17226	-0.06418	0.04390
	8 - 9	-0.08005	0.02897	0.13800
***	8 - 10	0.06337	0.17239	0.28141
	9 - 7	-0.20156	-0.09316	0.01525
	9 - 8	-0.13800	-0.02897	0.08005
***	9 - 10	0.03408	0.14342	0.25275
***	10 - 7	-0.34498	-0.23657	-0.12817
***	10 - 8	-0.28141	-0.17239	-0.06337
***	10 - 9	-0.25275	-0.14342	-0.03408

(MSE = .0641784)

Table 8, Reading Post Hoc Contrasts by Grade - Continued

	RCOMP12 Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	8 - 9	-0.11634	0.00520	0.12674
	8 - 10	-0.10686	0.01468	0.13622
***	8 - 7	0.01612	0.13661	0.25711
	9 - 8	-0.12674	-0.00520	0.11634
	9 - 10	-0.11242	0.00948	0.13137
***	9 - 7	0.01056	0.13141	0.25226
	10 - 9	-0.13622	-0.01468	0.10686
	10 - 9	-0.13137	-0.00948	0.11242
***	10 - 7	0.00108	0.12193	0.24279
***	7 - 8	-0.25711	-0.13661	-0.01612
***	7 - 9	-0.25226	-0.13141	-0.01056
***	7 - 10	-0.24279	-0.12193	-0.00108

(MSE = .0797647)

	RCOMP14			
	7 - 8	-0.03062	0.03397	0.09855
	7 - 9	-0.00286	0.06192	0.12670
***	7 - 10	0.01564	0.08042	0.14520
	8 - 7	-0.09855	-0.03397	0.03062
	8 - 9	-0.03720	0.02795	0.09310
	8 - 10	-0.01869	0.04646	0.11161
	9 - 7	-0.12670	-0.06192	0.00286
	9 - 8	-0.09310	-0.02795	0.03720
	9 - 10	-0.04684	0.01850	0.08384
***	10 - 7	-0.14520	-0.08042	-0.01564
	10 - 8	-0.11161	-0.04646	0.01869
	10 - 9	-0.08384	-0.01850	0.04684

(MSE = .022919)

Table 8, Reading Post Hoc Contrasts by Grade - Continued

RCOMP15	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	8 - 7	-0.08657	0.00052	0.08760
	8 - 9	-0.02533	0.06251	0.15036
***	8 - 10	0.01186	0.09971	0.18755
	7 - 8	-0.08760	-0.00052	0.08657
	7 - 9	-0.02535	0.06200	0.14934
***	7 - 10	0.01185	0.09919	0.18654
	9 - 8	-0.15036	-0.06251	0.02533
	9 - 7	-0.14934	-0.06200	0.02535
	9 - 10	-0.05090	0.03719	0.12529
***	10 - 8	-0.18755	-0.09971	-0.01186
***	10 - 7	-0.18654	-0.09919	-0.01185
	10 - 9	-0.12529	-0.03719	0.05090

(MSE = .041666)

* Alpha = 0.05; Confidence = 0.95; Df = 263; T = 1.62448
Comparisons significant at the 0.05 level are indicated by "***".

Table 9

Post Hoc Contrasts for Transformed Reading Competencies by Levels of Typerec

RCOMP1

Scheffe' Grouping	Mean	N	Typerec
A	0.76	151	1
B	0.52	193	2

MSE=0.057 LSD=0.051

RCOMP2

Scheffe' Grouping	Mean	N	Typerec
A	0.89	151	1
B	0.73	193	2

MSE=0.025 LSD=0.034

RCOMP3

Scheffe' Grouping	Mean	N	Typerec
A	0.86	151	1
B	0.62	193	2

MSE=0.041 LSD=0.044

RCOMP4

Scheffe' Grouping	Mean	N	Typerec
A	0.76	151	1
B	0.70	193	2

MSE=0.052 LSD=0.049

RCOMP5

Scheffe' Grouping	Mean	N	Typerec
A	0.78	151	1
B	0.61	193	2

MSE=0.060 LSD=0.052

RCOMP6

Scheffe' Grouping	Mean	N	Typerec
A	0.78	151	1
B	0.67	193	2

MSE=0.057 LSD=0.051

RCOMP7

Scheffe' Grouping	Mean	N	Typerec
A	0.76	151	1
B	0.62	193	2

MSE=0.060 LSD=0.052

RCOMP8

Scheffe' Grouping	Mean	N	Typerec
A	0.60	151	1
B	0.40	193	2

MSE=0.085 LSD=0.062

Table 9, Reading Post Hoc Contrasts by Typerec - Continued

RCOMP9

Scheffe' Grouping	Mean	N	Typerec
A	0.87	151	1
B	0.67	193	2

MSE=0.035 LSD=0.040

RCOMP10

Scheffe' Grouping	Mean	N	Typerec
A	0.87	151	1
B	0.71	193	2

MSE=0.029 LSD=0.036

RCOMP11

Scheffe' Grouping	Mean	N	Typerec
A	0.73	151	1
B	0.63	193	2

MSE=0.064 LSD=0.054

RCOMP12

Scheffe' Grouping	Mean	N	Typerec
A	0.59	151	1
B	0.51	193	2

MSE=0.080 LSD=0.060

RCOMP13

Scheffe' Grouping	Mean	N	Typerec
A	0.64	151	1
B	0.40	193	2

MSE=0.077 LSD=0.059

RCOMP14

Scheffe' Grouping	Mean	N	Typerec
A	0.92	151	1
B	0.70	193	2

MSE=0.023 LSD=0.032

* Alpha=0.05; Df=263; T=1.969;
Harmonic Mean of Cell Sizes=169.436;
Means with the same letter are not significantly different.

Table 10

Multiple Analyses of Variance for Transformed Language Competencies

Hotelling-Lawley Trace

	F approx.	df	p
Syscode	1.62	648,4322	0.0001
Schcode(Syscode)	1.25	504,4322	0.0003
Grade	2.13	54,722	0.0001
Typerec	13.58	18,242	0.0001
Lorder(Typerec)	1.16	36,482	0.2440
Grade*Typerec	1.20	54,722	0.1560

Pillai's Trace

	F approx.	df	p
Syscode	1.47	648,4662	0.0001
Schcode(Syscode)	1.19	504,4662	0.0034
Grade	2.06	54,732	0.0001
Typerec	13.58	18,242	0.0001
Rorder(Typerec)	1.14	36,486	0.2677
Grade*Typerec	1.16	54,732	0.2058

Wilks' Criterion

	F approx.	df	p
Syscode	1.55	648,3990	0.0001
Schcode(Syscode)	1.22	504,3747	0.0011
Grade	2.09	54,721	0.0001
Typerec	13.58	18,242	0.0001
Rorder(Typerec)	1.15	36,484	0.2556
Grade*Typerec	1.18	54,721	0.1811

Table 11

Analyses of Variance for Transformed Language Competencies (LCOMPs)

Dependent Variable	Source	df	Type III SS	F Value	p
LCOMP1	Syscode	36	2.96	2.17	0.0003
	Schcode(Syscode)	28	0.71	0.67	0.8990
	Grade	3	0.47	4.10	0.0074
	Typerec	1	3.21	84.60	0.0001
	Lorder(Typerec)	2	0.02	0.32	0.7259
	Grade*Typerec	3	0.07	0.64	0.5930
	Error	259	9.82		
	Total	332	17.40		
LCOMP2	Syscode	36	0.76	1.79	0.0054
	Schcode(Syscode)	28	0.37	1.13	0.3080
	Grade	3	0.05	1.39	0.2442
	Typerec	1	0.18	15.14	0.0001
	Lorder(Typerec)	2	0.05	1.92	0.1490
	Grade*Typerec	3	0.01	0.21	0.8901
	Error	259	3.05		
	Total	332	4.43		
LCOMP3	Syscode	36	3.95	2.80	0.0001
	Schcode(Syscode)	28	1.66	1.52	0.0512
	Grade	3	0.18	1.53	0.2058
	Typerec	1	3.61	92.07	0.0001
	Lorder(Typerec)	2	0.03	0.34	0.7124
	Grade*Typerec	3	0.04	0.33	0.8064
	Error	259	10.15		
	Total	332	19.79		
LCOMP4	Syscode	36	2.65	3.37	0.0001
	Schcode(Syscode)	28	0.78	1.27	0.1727
	Grade	3	0.14	2.12	0.0960
	Typerec	1	1.83	83.72	0.0001
	Lorder(Typerec)	2	0.10	2.34	0.0984
	Grade*Typerec	3	0.00	0.01	0.9949
	Error	259	5.67		
	Total	332	11.25		

Table 11, ANOVA for Transformed RCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
LCOMP5	Syscode	36	4.20	2.10	0.0005
	Schcode(Syscode)	28	2.32	1.50	0.0564
	Grade	3	0.28	1.70	0.1654
	Typerec	1	5.92	106.85	0.0001
	Lorder(Typerec)	2	0.02	0.16	0.8496
	Grade*Typerec	3	0.05	0.30	0.8267
	Error	259	14.36		
	Total	332	228.54		
LCOMP6	Syscode	36	4.06	1.96	0.0015
	Schcode(Syscode)	28	2.75	1.71	0.0168
	Grade	3	0.47	2.70	0.0452
	Typerec	1	0.11	1.99	0.1599
	Lorder(Typerec)	2	0.09	0.78	0.4593
	Grade*Typerec	3	0.26	1.51	0.2108
	Error	259	14.87		
	Total	332	22.69		
LCOMP7	Syscode	36	6.06	2.98	0.0001
	Schcode(Syscode)	28	3.24	2.04	0.0021
	Grade	3	1.65	9.75	0.0001
	Typerec	1	1.25	22.08	0.0001
	Lorder(Typerec)	2	0.27	2.40	0.0923
	Grade*Typerec	3	0.80	4.73	0.0033
	Error	259	14.63		
	Total	332	28.30		
LCOMP8	Syscode	36	6.09	3.02	0.0001
	Schcode(Syscode)	28	3.06	1.95	0.0039
	Grade	3	0.50	2.99	0.0311
	Typerec	1	0.77	13.78	0.0003
	Lorder(Typerec)	2	0.06	0.54	0.5826
	Grade*Typerec	3	0.07	0.41	0.7490
	Error	259	14.52		
	Total	332	26.52		
LCOMP9	Syscode	36	5.65	2.76	0.0001
	Schcode(Syscode)	28	2.88	1.81	0.0095
	Grade	3	0.63	3.71	0.0123
	Typerec	1	0.82	14.48	0.0002
	Lorder(Typerec)	2	0.08	0.72	0.4868
	Grade*Typerec	3	0.09	0.51	0.6790
	Error	259	14.73		
	Total	332	25.88		

Table 11, ANOVA for Transformed LCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
LCOMP10	Syscode	36	8.31	2.99	0.0001
	Schcode(Syscode)	28	3.45	1.59	0.0335
	Grade	3	1.62	6.98	0.0002
	Typerec	1	2.07	26.74	0.0001
	Lorder(Typerec)	2	0.08	0.55	0.5776
	Grade*Typerec	3	0.15	0.66	0.5794
	Error	259	20.01		
	Total	332	36.92		
LCOMP11	Syscode	36	3.06	2.00	0.0011
	Schcode(Syscode)	28	1.06	0.89	0.6253
	Grade	3	0.15	1.18	0.3178
	Typerec	1	1.56	36.80	0.0001
	Lorder(Typerec)	2	0.09	1.11	0.3310
	Grade*Typerec	3	0.06	0.47	0.7091
	Error	259	11.01		
	Total	332	16.93		
LCOMP12	Syscode	36	1.78	1.52	0.0346
	Schcode(Syscode)	28	0.95	1.05	0.4052
	Grade	3	0.07	0.75	0.5288
	Typerec	1	0.20	6.30	0.0127
	Lorder(Typerec)	2	0.25	3.90	0.0214
	Grade*Typerec	3	0.04	0.38	0.7699
	Error	259	8.41		
	Total	332	11.75		
LCOMP13	Syscode	36	1.97	2.01	0.0010
	Schcode(Syscode)	28	0.65	0.86	0.6784
	Grade	3	0.17	2.03	0.1091
	Typerec	1	0.22	8.19	0.0046
	Lorder(Typerec)	2	0.05	0.89	0.4111
	Grade*Typerec	3	0.01	0.06	0.9734
	Error	259	7.05		
	Total	332	10.16		
LCOMP14	Syscode	36	2.35	2.26	0.0001
	Schcode(Syscode)	28	1.12	1.39	0.0995
	Grade	3	0.21	2.43	0.0646
	Typerec	1	0.88	30.40	0.0001
	Lorder(Typerec)	2	0.03	0.47	0.6228
	Grade*Typerec	3	0.05	0.61	0.6121
	Error	259	7.49		
	Total	332	12.45		

Table 11, ANOVA for Transformed LCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
LCOMP15	Syscode	36	2.03	1.93	0.0020
	Schcode(Syscode)	28	1.29	1.57	0.0376
	Grade	3	0.10	1.09	0.3564
	Typerec	1	1.33	45.54	0.0001
	Lorder(Typerec)	2	0.04	0.73	0.4814
	Grade*Typerec	3	0.22	2.55	0.0554
	Error	259	7.59		
	Total	332	12.98		
LCOMP16	Syscode	36	1.10	1.78	0.0059
	Schcode(Syscode)	28	0.82	0.85	0.6825
	Grade	3	0.18	1.71	0.1642
	Typerec	1	1.45	42.17	0.0001
	Lorder(Typerec)	2	0.03	0.39	0.6772
	Grade*Typerec	3	0.15	1.45	0.2260
	Error	259	8.88		
	Total	332	13.89		
LCOMP17	Syscode	36	3.49	2.12	0.0004
	Schcode(Syscode)	28	1.64	1.28	0.1624
	Grade	3	0.67	4.91	0.0026
	Typerec	1	2.57	56.15	0.0001
	Lorder(Typerec)	2	0.09	0.96	0.3839
	Grade*Typerec	3	0.09	0.67	0.5732
	Error	259	11.85		
	Total	332	20.85		
LCOMP18	Syscode	36	3.37	2.45	0.0001
	Schcode(Syscode)	28	1.72	1.60	0.0313
	Grade	3	0.05	0.46	0.7130
	Typerec	1	0.26	6.83	0.0095
	Lorder(Typerec)	2	0.07	0.89	0.4104
	Grade*Typerec	3	0.05	0.47	0.7075
	Error	259	9.92		
	Total	332	15.67		

Table 12

Post Hoc Contrasts for Transformed Language Competencies by Levels of Grade

LCOMP1	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	9 - 10	-0.06957	0.01631	0.10220
	9 - 8	-0.02665	0.05898	0.14462
***	9 - 7	0.01972	0.10536	0.19100
	10 - 9	-0.01631	-0.01631	0.06957
	10 - 8	-0.04164	0.04267	0.12697
***	10 - 7	0.00474	0.08905	0.17335
	8 - 9	-0.14462	-0.05898	0.02665
	8 - 10	-0.12697	-0.04267	0.04164
	8 - 7	-0.03768	0.04638	0.13043
***	7 - 9	-0.19100	-0.10536	-0.01972
***	7 - 10	-0.17335	-0.08905	-0.00474
	7 - 8	-0.13043	-0.04638	0.03768

(MSE = .0379211)

Table 12, Language Post Hoc Contrasts by Grade - Continued

LCOMP7	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Lower Confidence Limit
***	9 - 8	0.02698	0.13150	0.23602
***	9 - 10	0.05972	0.16454	0.26936
***	9 - 7	0.07223	0.17675	0.28128
***	8 - 9	-0.23602	-0.13150	-0.02698
	8 - 10	-0.06986	0.03304	0.13594
	8 - 7	-0.05734	0.04525	0.14785
***	10 - 9	-0.26936	-0.16454	-0.05972
	10 - 8	-0.13594	-0.03304	0.06986
	10 - 7	-0.09068	0.01222	0.11511
***	7 - 9	-0.28128	-0.17675	-0.07223
	7 - 8	-0.14785	-0.04525	0.05734
	7 - 10	-0.11511	-0.01222	0.09068
	(MSE = .0564913)			
LCOMP8				
***	9 - 10	0.00946	0.11387	0.21829
***	9 - 8	0.01777	0.12189	0.22601
***	9 - 7	0.01987	0.12399	0.22811
***	10 - 9	-0.21829	-0.11387	-0.00946
	10 - 8	-0.09448	0.00802	0.11052
	10 - 7	-0.09239	0.01011	0.11261
***	8 - 9	-0.22601	-0.12189	-0.01777
	8 - 10	-0.11052	-0.00802	0.09448
	8 - 7	-0.10010	0.00210	0.10429
***	7 - 9	-0.22811	-0.12399	-0.01987
	7 - 10	-0.11261	-0.01011	0.09239
	7 - 8	-0.10429	-0.00210	0.10010
	(MSE = .0560574)			

Table 12, Language Post Hoc Contrasts by Grade - Continued

	LCOMP9 Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	9 - 7	-0.02696	0.07791	0.18278
***	9 - 8	0.00241	0.10728	0.21215
***	9 - 10	0.02640	0.13156	0.23673
	7 - 9	-0.18278	-0.07791	0.02696
	7 - 8	-0.07356	0.02937	0.13230
	7 - 10	-0.04958	0.05365	0.15689
***	8 - 9	-0.21215	-0.10728	-0.00241
	8 - 7	-0.13230	-0.02937	0.07356
	8 - 10	-0.07895	0.02428	0.12752
***	10 - 9	-0.23673	-0.13156	-0.02640
	10 - 7	-0.15689	-0.05365	0.04958
	10 - 8	-0.12752	-0.02428	0.07895

(MSE = .0568653)

	LCOMP10			
***	9 - 10	0.00547	0.12805	0.25064
***	9 - 8	0.03860	0.16084	0.28307
***	9 - 7	0.07536	0.19759	0.31982
***	10 - 9	-0.25064	-0.12805	-0.00547
	10 - 8	-0.08755	0.03278	0.15312
	10 - 7	-0.05080	0.06954	0.18987
***	8 - 9	-0.28307	-0.16084	-0.03860
	8 - 10	-0.15312	-0.03278	0.08755
	8 - 7	-0.08322	0.03675	0.15673
***	7 - 9	-0.31982	-0.19759	-0.07536
	7 - 10	-0.18987	-0.06954	0.05080
	7 - 8	-0.15673	-0.03675	0.08322

(MSE = .0772583)

Table 12, Languaye Post Hoc Contrasts by Grade - Continued

LCOMP17	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	10 - 9	-0.09337	0.00096	0.09530
	10 - 8	-0.04833	0.04427	0.13688
***	10 - 7	0.01973	0.11234	0.20494
	9 - 10	-0.09530	-0.00096	0.09337
	9 - 8	-0.05075	0.04331	0.13738
***	9 - 7	0.01731	0.11138	0.20544
	8 - 10	-0.13688	-0.04427	0.04833
	8 - 9	-0.13738	-0.04331	0.05075
	8 - 7	-0.02426	0.06806	0.16039
***	7 - 10	-0.20494	-0.11234	-0.01973
***	7 - 9	-0.20544	-0.11138	-0.01731
	7 - 8	-0.16039	-0.06806	0.02426

(MSE = .0457529)

* Alpha = 0.05; Confidence = 0.95; Df = 259; T = 1.62464
Comparisons significant at the 0.05 level are indicated by "***".

Table 13

Post Hoc Contrasts for Transformed Language Competencies by Levels of Typerec

LCOMP1

Scheffe' Grouping	Mean	N	Typerec
A	0.91	153	1
B	0.71	180	2

MSE=0.038 LSD=0.042

LCOMP2

Scheffe' Grouping	Mean	N	Typerec
A	0.94	153	1
B	0.89	180	2

MSE=0.012 LSD=0.023

LCOMP3

Scheffe' Grouping	Mean	N	Typerec
A	0.83	153	1
B	0.61	180	2

MSE=0.039 LSD=0.043

LCOMP4

Scheffe' Grouping	Mean	N	Typerec
A	0.91	153	1
B	0.75	180	2

MSE=0.022 LSD=0.032

LCOMP5

Scheffe' Grouping	Mean	N	Typerec
A	0.76	153	1
B	0.48	180	2

MSE=0.055 LSD=0.051

LCOMP7

Scheffe' Grouping	Mean	N	Typerec
A	0.67	153	1
B	0.54	180	2

MSE=0.056 LSD=0.051

LCOMP8

Scheffe' Grouping	Mean	N	Typerec
A	0.80	153	1
B	0.70	180	2

MSE=0.056 LSD=0.051

LCOMP9

Scheffe' Grouping	Mean	N	Typerec
A	0.79	153	1
B	0.69	180	2

MSE=0.057 LSD=0.052

Table 13, Language Post Hoc Contrasts by Typerec - Continued

LCOMP10

Scheffe' Grouping	Mean	N	Typerec
A	0.58	153	1
B	0.42	180	2

MSE=0.077 LSD=0.060

LCOMP11

Scheffe' Grouping	Mean	N	Typerec
A	0.83	153	1
B	0.69	180	2

MSE=0.043 LSD=0.045

LCOMP12

Scheffe' Grouping	Mean	N	Typerec
A	0.87	153	1
B	0.83	180	2

MSE=0.032 LSD=0.039

LCOMP13

Scheffe' Grouping	Mean	N	Typerec
A	0.89	153	1
B	0.84	180	2

MSE=0.027 LSD=0.036

LCOMP14

Scheffe' Grouping	Mean	N	Typerec
A	0.90	153	1
B	0.80	180	2

MSE=0.029 LSD=0.037

LCOMP15

Scheffe' Grouping	Mean	N	Typerec
A	0.91	153	1
B	0.78	180	2

MSE=0.029 LSD=0.037

LCOMP16

Scheffe' Grouping	Mean	N	Typerec
A	0.89	153	1
B	0.76	180	2

MSE=0.034 LSD=0.040

LCOMP17

Scheffe' Grouping	Mean	N	Typerec
A	0.86	153	1
B	0.68	180	2

MSE=0.046 LSD=0.046

Table 13, Language Post Hoc Contrasts by Typerec - Continued

LCOMP18

Scheffe' Grouping	Mean	N	Typerec
A	0.83	153	1
B	0.78	180	2

MSE=0.038 LSD=0.042

* Alpha=0.05; Df=259; T=1.969;
Harmonic Mean of Cell Sizes=165.405;
Means with the same letter are not significantly different.

Table 14

Multiple Analyses of Variance for Transformed Mathematics Competencies

Hotelling-Lawley Trace

	F approx.	df	p
Syscode	1.89	1073,7078	0.0001
Schcode(Syscode)	1.71	870,7078	0.0001
Grade	5.10	87,734	0.0001
Typerec	10.43	29,246	0.0001
Morder(Typerec)	0.57	58,490	0.9954
Grade*Typerec	1.15	87,734	0.1818

Pillai's Trace

	F approx.	df	p
Syscode	1.66	1073,7946	0.0001
Schcode(Syscode)	1.41	870,7946	0.0001
Grade	3.90	87,744	0.0001
Typerec	10.43	29,246	0.0001
Rorder(Typerec)	0.57	58,494	0.9950
Grade*Typerec	1.14	87,744	0.1942

Wilks' Criterion

	F approx.	df	p
Syscode	1.79	1073,7946	0.0001
Schcode(Syscode)	1.55	870,5287	0.0001
Grade	4.45	87,736	0.0001
Typerec	10.43	29,246	0.0001
Rorder(Typerec)	0.57	58,492	0.9952
Grade*Typerec	1.14	87,736	0.1881

Table 15

Analyses of Variance for Transformed Mathematics Competencies (MCOMPs)

Dependent Variable	Source	df	Type III SS	F Value	p
MCOMP1	Syscode	37	5.77	2.28	0.0001
	Schcode(Syscode)	30	3.18	1.55	0.0369
	Grade	3	2.76	13.49	0.0001
	Typerec	1	1.66	24.27	0.0001
	Morder(Typerec)	2	0.11	0.83	0.4380
	Grade*Typerec	3	0.25	1.22	0.3013
	Error	274	18.70		
	Total	350	34.23		
MCOMP2	Syscode	37	2.60	2.06	0.0006
	Schcode(Syscode)	30	2.14	2.10	0.0010
	Grade	3	3.05	29.88	0.0001
	Typerec	1	0.53	15.74	0.0001
	Morder(Typerec)	2	0.05	0.81	0.4478
	Grade*Typerec	3	0.04	0.44	0.7287
	Error	274	9.31		
	Total	350	19.64		
MCOMP3	Syscode	37	4.15	2.71	0.0001
	Schcode(Syscode)	30	2.17	1.74	0.0117
	Grade	3	4.03	32.41	0.0001
	Typerec	1	0.04	0.90	0.3442
	Morder(Typerec)	2	0.07	0.82	0.4432
	Grade*Typerec	3	0.47	3.79	0.0110
	Error	274	11.35		
	Total	350	24.26		
MCOMP4	Syscode	37	3.14	2.53	0.0001
	Schcode(Syscode)	30	2.62	2.61	0.0001
	Grade	3	3.24	32.30	0.0001
	Typerec	1	0.01	0.34	0.5588
	Morder(Typerec)	2	0.08	1.22	0.2960
	Grade*Typerec	3	0.30	3.03	0.0293
	Error	274	9.17		
	Total	350	20.08		

Table 15, ANOVA for Transformed MCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
MCOMP5	Syscode	37	2.69	2.46	0.0001
	Schcode(Syscode)	30	2.85	3.22	0.0001
	Grade	3	2.30	26.00	0.0001
	Typerec	1	0.01	0.19	0.6605
	Morder(Typerec)	2	0.06	1.06	0.3479
	Grade*Typerec	3	0.26	2.93	0.0337
	Error	274	8.10		
	Total	350	17.11		
MCOMP6	Syscode	37	2.77	2.29	0.0001
	Schcode(Syscode)	30	2.52	2.58	0.0001
	Grade	3	2.30	23.52	0.0001
	Typerec	1	0.00	0.07	0.7844
	Morder(Typerec)	2	0.05	0.70	0.4964
	Grade*Typerec	3	0.18	1.85	0.1359
	Error	274	8.93		
	Total	350	17.62		
MCOMP7	Syscode	37	3.33	2.26	0.0001
	Schcode(Syscode)	30	2.63	2.20	0.0005
	Grade	3	1.31	11.00	0.0001
	Typerec	1	0.25	6.28	0.0128
	Morder(Typerec)	2	0.02	0.24	0.7879
	Grade*Typerec	3	0.10	0.87	0.4592
	Error	274	10.92		
	Total	350	18.64		
MCOMP8	Syscode	37	2.16	1.84	0.0034
	Schcode(Syscode)	30	2.32	2.44	0.0001
	Grade	3	2.11	22.17	0.0001
	Typerec	1	0.12	3.75	0.0537
	Morder(Typerec)	2	0.04	0.69	0.5012
	Grade*Typerec	3	0.24	2.50	0.0585
	Error	274	8.69		
	Total	350	16.43		
MCOMP9	Syscode	37	2.98	1.52	0.0325
	Schcode(Syscode)	30	2.09	1.32	0.1292
	Grade	3	1.07	6.77	0.0003
	Typerec	1	0.53	9.96	0.0018
	Morder(Typerec)	2	0.03	0.24	0.7302
	Grade*Typerec	3	0.15	0.95	0.4184
	Error	274	14.49		
	Total	350	22.23		

Table 15, ANOVA for Transformed MCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
MCOMP10	Syscode	37	2.95	1.44	0.0531
	Schcode(Syscode)	30	2.76	1.67	0.0190
	Grade	3	1.31	7.89	0.0001
	Typerec	1	0.79	14.24	0.0002
	Morder(Typerec)	2	0.01	0.10	0.9028
	Grade*Typerec	3	0.40	2.39	0.0678
	Error	274	15.13		
	Total	350	24.39		
MCOMP11	Syscode	37	4.73	2.25	0.0001
	Schcode(Syscode)	30	2.58	1.51	0.0475
	Grade	3	0.44	2.59	0.0523
	Typerec	1	0.65	11.38	0.0009
	Morder(Typerec)	2	0.09	0.83	0.4378
	Grade*Typerec	3	0.04	0.23	0.8775
	Error	274	15.60		
	Total	350	23.93		
MCOMP12	Syscode	37	4.78	1.81	0.0042
	Schcode(Syscode)	30	2.58	1.20	0.2200
	Grade	3	4.29	20.03	0.0001
	Typerec	1	0.43	5.99	0.0150
	Morder(Typerec)	2	0.09	0.64	0.5268
	Grade*Typerec	3	0.33	1.52	0.2084
	Error	274	19.57		
	Total	350	34.93		
MCOMP13	Syscode	37	4.58	1.85	0.0031
	Schcode(Syscode)	30	2.10	1.05	0.4056
	Grade	3	1.29	6.41	0.0004
	Typerec	1	2.47	36.89	0.0001
	Morder(Typerec)	2	0.01	0.05	0.9510
	Grade*Typerec	3	0.08	0.44	0.7316
	Error	274	18.32		
	Total	350	29.97		
MCOMP14	Syscode	37	3.37	2.60	0.0001
	Schcode(Syscode)	30	2.51	2.39	0.0001
	Grade	3	1.77	16.81	0.0001
	Typerec	1	1.73	49.39	0.0001
	Morder(Typerec)	2	0.03	0.38	0.6808
	Grade*Typerec	3	0.12	1.11	0.3437
	Error	274	9.60		
	Total	350	19.29		

Table 15, ANOVA for Transformed MCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
MCOMP15	Syscode	37	1.81	1.82	0.0039
	Schcode(Syscode)	30	2.09	2.58	0.0001
	Grade	3	1.58	19.53	0.0001
	Typerec	1	1.71	63.64	0.0001
	Morder(Typerec)	2	0.06	1.20	0.3022
	Grade*Typerec	3	0.05	0.63	0.5975
	Error	274	7.37		
	Total	350	15.25		
MCOMP16	Syscode	37	4.68	2.40	0.0001
	Schcode(Syscode)	30	3.57	2.25	0.0003
	Grade	3	0.47	2.94	0.0332
	Typerec	1	1.26	23.83	0.0001
	Morder(Typerec)	2	0.08	0.74	0.4778
	Grade*Typerec	3	0.24	1.54	0.2030
	Error	274	14.46		
	Total	350	24.97		
MCOMP17	Syscode	37	4.25	1.92	0.0018
	Schcode(Syscode)	30	3.56	1.98	0.0024
	Grade	3	0.21	1.18	0.3189
	Typerec	1	1.64	27.30	0.0001
	Morder(Typerec)	2	0.23	1.93	0.1466
	Grade*Typerec	3	0.31	1.72	0.1620
	Error	274	16.42		
	Total	350	27.34		
MCOMP18	Syscode	37	5.26	1.90	0.0020
	Schcode(Syscode)	30	3.44	1.54	0.0408
	Grade	3	0.26	1.18	0.3191
	Typerec	1	2.86	38.25	0.0001
	Morder(Typerec)	2	0.04	0.29	0.7495
	Grade*Typerec	3	0.13	0.57	0.6412
	Error	274	20.46		
	Total	350	32.31		
MCOMP19	Syscode	37	2.67	1.86	0.0029
	Schcode(Syscode)	30	2.20	1.89	0.0044
	Grade	3	2.07	17.74	0.0001
	Typerec	1	0.87	22.37	0.0001
	Morder(Typerec)	2	0.03	0.41	0.6838
	Grade*Typerec	3	0.27	2.46	0.0623
	Error	274	10.64		
	Total	350	20.26		

Table 15, ANOVA for Transformed MCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
MCOMP20	Syscode	37	3.36	2.07	0.0006
	Schcode(Syscode)	30	2.41	1.83	0.0067
	Grade	3	0.79	6.04	0.0006
	Typerec	1	5.52	125.75	0.0001
	Morder(Typerec)	2	0.00	0.04	0.9632
	Grade*Typerec	3	0.11	0.83	0.4793
	Error	274	12.02		
	Total	350	25.04		
MCOMP21	Syscode	37	3.35	1.94	0.0016
	Schcode(Syscode)	30	2.70	1.93	0.0034
	Grade	3	2.00	14.32	0.0001
	Typerec	1	1.40	29.91	0.0001
	Morder(Typerec)	2	0.04	0.47	0.6286
	Grade*Typerec	3	0.05	0.35	0.7884
	Error	274	12.80		
	Total	350	23.47		
MCOMP22	Syscode	37	4.60	2.26	0.0061
	Schcode(Syscode)	30	3.00	1.81	0.0074
	Grade	3	2.20	13.28	0.0001
	Typerec	1	1.04	18.81	0.0001
	Morder(Typerec)	2	0.03	0.29	0.7490
	Grade*Typerec	3	0.05	0.29	0.8357
	Error	274	15.11		
	Total	350	26.77		
MCOMP23	Syscode	37	4.66	1.86	0.0028
	Schcode(Syscode)	30	2.87	1.41	0.0804
	Grade	3	0.78	3.87	0.0099
	Typerec	1	0.07	1.10	0.2954
	Morder(Typerec)	2	0.03	0.20	0.8216
	Grade*Typerec	3	0.27	1.35	0.2581
	Error	274	18.54		
	Total	350	28.29		
MCOMP24	Syscode	37	4.63	1.80	0.0046
	Schcode(Syscode)	30	3.49	1.67	0.0181
	Grade	3	0.44	2.13	0.0953
	Typerec	1	1.44	20.64	0.0001
	Morder(Typerec)	2	0.00	0.02	0.9769
	Grade*Typerec	3	0.17	0.82	0.4848
	Error	274	19.06		
	Total	350	30.09		

Table 15, ANOVA for Transformed MCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
MCOMP25	Syscode	37	5.70	2.21	0.0002
	Schcode(Syscode)	30	3.17	1.52	0.0451
	Grade	3	0.29	1.41	0.2395
	Typerec	1	1.30	18.64	0.0001
	Morder(Typerec)	2	0.05	0.36	0.6986
	Grade*Typerec	3	0.06	0.27	0.8466
	Error	274	19.06		
	Total	350	29.19		
MCOMP26	Syscode	37	5.88	2.12	0.0004
	Schcode(Syscode	30	2.42	1.08	0.3645
	Grade	3	0.26	1.16	0.3267
	Typerec	1	2.38	31.76	0.0001
	Morder(Typerec)	2	0.04	0.26	0.7679
	Grade*Typerec	3	0.30	1.33	0.2632
	Error	274	20.53		
	Total	350	31.99		
MCOMP27	Syscode	37	9.00	3.23	0.0001
	Schcode(Syscode)	30	5.02	2.20	0.0005
	Grade	3	1.48	6.50	0.0004
	Typerec	1	0.02	0.20	0.6571
	Morder(Typerec)	2	0.10	0.64	0.5274
	Grade*Typerec	3	0.45	1.97	0.1172
	Error	274	20.83		
	Total	350	36.12		
MCOMP28	Syscode	37	4.71	1.86	0.0028
	Schcode(Syscode)	30	3.30	1.61	0.0260
	Grade	3	1.84	9.00	0.0001
	Typerec	1	0.01	0.15	0.7032
	Morder(Typerec)	2	0.05	0.36	0.6990
	Grade*Typerec	3	0.18	0.89	0.4493
	Error	274	18.69		
	Total	350	28.27		

Table 15, ANOVA for Transformed MCOMPs - Continued

Dependent Variable	Source	df	Type III SS	F Value	p
MCOMP29	Syscode	37	5.93	2.26	0.0001
	Schcode(Syscode)	30	3.51	1.65	0.0206
	Grade	3	1.40	6.60	0.0003
	Typerec	1	0.93	13.19	0.0003
	Morder(Typerec)	2	0.01	0.05	0.9513
	Grade*Typerec	3	0.20	0.96	0.4111
	Error	274	19.39		
	Total	350	30.09		

Table 16

Post Hoc Contrasts for Transformed Mathematics Competencies by Levels of Grade

MCOMP1	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	7 - 8	-0.03022	0.07963	0.18948
***	7 - 9	0.10293	0.21441	0.32589
***	7 - 10	0.19540	0.30557	0.41573
	8 - 7	-0.18948	-0.07963	0.03022
***	8 - 9	0.02300	0.13478	0.24656
***	8 - 10	0.11547	0.22593	0.33640
***	9 - 7	-0.32589	-0.21441	-0.10293
***	9 - 8	-0.24656	-0.13478	-0.02300
	9 - 10	-0.02094	0.09115	0.20324
***	10 - 7	-0.41573	-0.30557	-0.19540
***	10 - 8	-0.33640	-0.22593	-0.11547
	10 - 9	-0.20324	-0.09115	0.02094

(MSE = .068241)

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

MCOMP2	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Lower Confidence Limit
	7 - 8	-0.07540	0.00212	0.07963
***	7 - 9	0.08188	0.16054	0.23921
***	7 - 10	0.12109	0.28983	0.36756
	8 - 7	-0.07963	-0.00212	0.07540
***	8 - 9	0.07954	0.15842	0.23730
	8 - 10	0.20976	0.28771	0.36566
***	9 - 7	-0.23921	-0.16054	-0.08188
	9 - 8	-0.23730	-0.15842	-0.07954
	9 - 10	0.05019	0.12929	0.20838
***	10 - 7	-0.36756	-0.28983	-0.21209
***	10 - 8	-0.36566	-0.28771	-0.20976
***	10 - 9	-0.20838	-0.12929	-0.05019

(MSE = .033979)

MCOMP3				
	7 - 8	-0.04337	0.04222	0.12780
***	7 - 9	0.13851	0.22536	0.31222
***	7 - 10	0.23381	0.31964	0.40547
	8 - 8	-0.12780	-0.04222	0.04337
***	8 - 9	0.90605	0.18313	0.27024
***	8 - 10	0.19135	0.27742	0.36349
***	9 - 7	-0.31222	-0.22536	-0.13851
***	9 - 8	-0.27024	-0.18315	-0.09605
***	9 - 10	0.00694	0.09428	0.18161
***	10 - 7	-0.40547	-0.31964	-0.23381
***	10 - 8	-0.36349	-0.27742	-0.19135
***	10 - 9	-0.18161	-0.09428	-0.00694

(MSE = .0414246)

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

MCOMP4	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	7 - 8	-0.05383	0.02310	0.10002
***	7 - 9	0.13477	0.21284	0.29091
***	7 - 10	0.20995	0.28709	0.36424
	8 - 7	-0.10002	-0.02310	0.05383
***	8 - 9	0.11146	0.18974	0.26802
***	8 - 10	0.18664	0.26399	0.34135
***	9 - 7	-0.29091	-0.21284	-0.13477
***	9 - 8	-0.26802	-0.18974	-0.11146
	9 - 10	-0.00424	0.07425	0.15275
***	10 - 7	-0.36424	-0.28709	-0.20995
***	10 - 8	-0.34135	-0.26399	-0.18664
	10 - 9	-0.15275	-0.07425	0.00424

(MSE = .0334642)

MCOMP5				
	8 - 7	-0.06588	0.00641	0.07869
***	8 - 9	0.07690	0.15045	0.22400
***	8 - 10	0.16463	0.23732	0.31001
	7 - 8	-0.07869	-0.00641	0.06588
***	7 - 9	0.07069	0.14405	0.21740
***	7 - 10	0.15842	0.23091	0.30340
***	9 - 8	-0.22400	-0.15045	-0.07690
***	9 - 7	-0.21740	-0.14405	-0.07069
***	9 - 10	0.01311	0.08687	0.16062
***	10 - 8	-0.31001	-0.23732	-0.16463
***	10 - 7	-0.30340	-0.23091	-0.15842
***	10 - 9	-0.16062	-0.08687	-0.01311

(MSE = .0295473)

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

	MCOMP6 Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	8 - 7	-0.06616	0.00975	0.08566
***	8 - 9	0.04870	0.12594	0.20319
***	8 - 10	0.16008	0.23642	0.31276
	7 - 8	-0.08566	-0.00975	0.06616
***	7 - 9	0.03916	0.11619	0.19323
***	7 - 10	0.15054	0.22667	0.30280
***	9 - 8	-0.20319	-0.12594	-0.04870
***	9 - 7	-0.19323	-0.11619	-0.03916
***	9 - 10	0.03302	0.11048	0.18794
***	10 - 8	-0.31276	-0.23642	-0.16008
***	10 - 7	-0.30280	-0.22667	-0.15054
***	10 - 9	-0.18794	-0.11048	-0.03302

(MSE = .0325889)

MCOMP7

***	8 - 9	0.02039	0.10580	0.19121
***	8 - 7	0.04629	0.13023	0.21416
***	8 - 10	0.10884	0.19325	0.27766
***	9 - 8	-0.19121	-0.10580	-0.02039
	9 - 7	-0.06076	0.02442	0.10960
***	9 - 10	0.00180	0.08745	0.17309
***	7 - 8	-0.21416	-0.13023	0.04629
	7 - 9	-0.10960	-0.02442	0.06076
	7 - 10	-0.02115	0.06302	0.14720
***	10 - 8	-0.27766	-0.19325	-0.10884
***	10 - 9	-0.17309	-0.08745	-0.00180
	10 - 7	-0.14720	-0.06302	0.02115

(MSE = .0398415)

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

MCOMP8	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	8 - 7	-0.06198	0.01292	0.08781
***	8 - 9	0.04662	0.12283	0.19904
***	8 - 10	0.14936	0.22468	0.30000
	7 - 8	-0.08781	-0.01292	0.06198
***	7 - 9	0.03391	0.10991	0.18592
***	7 - 10	0.13666	0.21176	0.28687
***	9 - 8	-0.19904	-0.12283	-0.04662
***	9 - 7	-0.18592	-0.10991	-0.03391
***	9 - 10	0.02543	0.10185	0.17827
***	10 - 8	-0.30000	-0.22468	-0.14936
***	10 - 7	-0.28687	-0.21176	-0.13666
***	10 - 9	-0.17827	-0.10185	-0.02543

(MSE = .0317217)

MCOMP9				
	8 - 7	-0.08636	0.01032	0.10701
***	8 - 9	0.03703	0.13542	0.23381
***	8 - 10	0.09750	0.19472	0.29195
	7 - 8	-0.10701	-0.01032	0.08636
***	7 - 9	0.02698	0.12510	0.22322
***	7 - 10	0.08744	0.18440	0.28136
***	9 - 8	-0.23381	-0.13532	-0.03703
***	9 - 7	-0.22322	-0.12510	-0.02698
	9 - 10	-0.03935	0.05930	0.15796
***	10 - 8	-0.29195	-0.19472	-0.09750
***	10 - 7	-0.28136	-0.18440	-0.08744
	10 - 9	-0.15796	-0.05930	0.03935

(MSE = .052865)

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

	MCOMP10 Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	7 - 8	-0.06468	0.03415	0.13297
***	7 - 9	0.03109	0.13138	0.23168
***	7 - 10	0.11155	0.21066	0.30977
	8 - 7	-0.13297	-0.03415	0.06468
	8 - 9	-0.00333	0.09724	0.19781
***	8 - 10	0.07713	0.17651	0.27590
***	9 - 7	-0.23168	-0.13138	-0.03109
	9 - 8	-0.19781	-0.09724	0.00333
	9 - 10	-0.02157	0.07928	0.18012
***	10 - 7	-0.30977	-0.21066	-0.11155
***	10 - 8	-0.27590	-0.17651	-0.07713
	10 - 9	-0.18012	-0.07928	0.02157

(MSE = .0552356)

	MCOMP13			
	8 - 7	-0.10603	0.00272	0.11146
	8 - 9	-0.01083	0.09983	0.21049
***	8 - 10	0.08384	0.19319	0.30255
	7 - 8	-0.11146	-0.00272	0.10603
	7 - 9	-0.01325	0.09711	0.20747
***	7 - 10	0.08142	0.19048	0.29953
	9 - 8	-0.21049	-0.09983	0.01083
	9 - 7	-0.20747	-0.09711	0.01325
	9 - 10	-0.01760	0.09337	0.20433
***	10 - 8	-0.30255	-0.19319	-0.08384
***	10 - 7	-0.29953	-0.19048	-0.08142
	10 - 9	-0.20433	-0.09337	0.01760

(MSE = .0668771)

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

	MCOMP14 Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	8 - 7	-0.03564	0.04306	0.12177
	8 - 9	-0.01365	0.06644	0.14653
***	8 - 10	0.12368	0.20283	0.28198
	7 - 8	-0.12177	-0.04306	0.03564
	7 - 9	-0.05650	0.02338	0.10325
***	7 - 10	0.08083	0.15976	0.23870
	9 - 8	-0.14653	-0.06644	0.01365
	9 - 7	-0.10325	-0.02338	0.05650
***	9 - 10	0.05607	0.13639	0.21670
***	10 - 8	-0.28198	-0.20283	-0.12368
***	10 - 7	-0.23870	-0.15976	-0.08083
***	10 - 9	-0.21670	-0.13639	-0.05607

(MSE = .035034)

	MCOMP15			
	8 - 7	-0.01890	0.05009	0.11908
***	8 - 9	0.01578	0.08598	0.15618
***	8 - 10	0.14336	0.21274	0.28212
	7 - 8	-0.11908	-0.05009	0.01890
	7 - 9	-0.03412	0.03589	0.10591
***	7 - 10	0.09346	0.16265	0.23184
***	9 - 8	-0.15618	-0.08598	-0.01578
	9 - 7	-0.10591	-0.03589	0.03412
***	9 - 10	0.05636	0.12676	0.19716
***	10 - 8	-0.28212	-0.21274	-0.14336
***	10 - 7	-0.23184	-0.16265	-0.09346
***	10 - 9	-0.19716	-0.12676	-0.05636

(MSE = .0269171)

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

	MCOMP16 Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	8 - 9	-0.05044	0.04786	0.14617
	8 - 7	-0.03400	0.06261	0.15922
***	8 - 10	0.02495	0.12210	0.21925
	9 - 8	-0.14617	-0.04786	0.05044
	9 - 7	-0.08330	0.01474	0.11279
	9 - 10	-0.02435	0.07423	0.17281
	7 - 8	-0.15922	-0.06261	0.03400
	7 - 9	-0.11279	-0.01474	0.08330
	7 - 10	-0.03739	0.05949	0.15637
***	10 - 8	-0.21925	-0.12210	-0.02495
	10 - 9	-0.17281	-0.07423	0.02435
	10 - 7	-0.15637	-0.05949	0.03739

(MSE = .0527808)

MCOMP19

	8 - 7	-0.06450	0.01837	0.10125
***	8 - 9	0.10766	0.19200	0.27633
***	8 - 10	0.15574	0.23908	0.32243
	7 - 8	-0.10125	-0.01837	0.06450
***	7 - 9	0.08952	0.17362	0.25773
***	7 - 10	0.13760	0.22071	0.30382
***	9 - 8	-0.27633	-0.19200	-0.10766
***	9 - 7	-0.25773	-0.17362	-0.08952
	9 - 10	-0.03748	0.04709	0.13165
***	10 - 8	-0.32243	-0.23908	-0.15574
***	10 - 7	-0.30382	-0.22071	-0.13760
	10 - 9	-0.13165	-0.04709	0.03748

(MSE = .0388428)

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

	MCOMP20 Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	8 - 7	-0.07060	0.01747	0.10555
	8 - 9	-0.02516	0.06446	0.15408
***	8 - 10	0.07599	0.16455	0.25312
	7 - 8	-0.10555	-0.01747	0.07060
	7 - 9	-0.04240	0.04698	0.13636
***	7 - 10	0.05876	0.14708	0.23540
	9 - 8	-0.15408	-0.06446	0.02516
	9 - 7	-0.13636	-0.04698	0.04240
***	9 - 10	0.01023	0.10010	0.18997
***	10 - 8	-0.25312	-0.16455	-0.07599
***	10 - 7	-0.23540	-0.14708	-0.05876
***	10 - 9	-0.18997	-0.10010	-0.01023

(MSE = .0438669)

MCOMP21

	7 - 8	-0.08511	0.00577	0.09664
***	7 - 9	0.06831	0.16054	0.25277
***	7 - 10	0.12791	0.21905	0.31019
	8 - 7	-0.09664	-0.00577	0.08511
***	8 - 9	0.06230	0.15477	0.24725
***	8 - 10	0.12189	0.21328	0.30467
***	9 - 7	-0.25277	-0.16054	-0.06831
***	9 - 8	-0.24725	-0.15477	-0.06230
	9 - 10	-0.-3422	0.05851	0.15124
***	10 - 7	-0.31019	-0.21905	-0.12791
***	10 - 8	-0.3-467	-0.21328	-0.12189
	10 - 9	-0.15124	-0.05851	0.03422

(MSE = .0467053)

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

	MCOMP22 Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	8 - 7	-0.08201	0.01673	0.11547
***	8 - 9	0.05319	0.15367	0.25415
***	8 - 10	0.12326	0.22256	0.32185
	7 - 8	-0.11547	-0.01673	0.08201
***	7 - 9	0.03673	0.13694	0.23715
***	7 - 10	0.10680	0.20583	0.30485
***	9 - 8	-0.25415	-0.15367	-0.05319
***	9 - 7	-0.23715	-0.13694	-0.03673
	9 - 10	-0.03187	0.06889	0.16964
***	10 - 8	-0.32185	-0.22256	-0.12326
***	10 - 7	-0.30485	-0.20583	-0.10680
	10 - 9	-0.16964	-0.06889	0.03187

(MSE = .0551392)

MCOMP23

	7 - 8	-0.10154	0.00785	0.11724
***	7 - 9	0.03899	0.15000	0.26101
***	7 - 10	0.07499	0.18469	0.29439
	8 - 7	-0.11724	-0.00785	0.10154
***	8 - 9	0.03084	0.14215	0.25346
***	8 - 10	0.06684	0.17684	0.28684
***	9 - 7	-0.26101	-0.15000	-0.03899
***	9 - 8	-0.25346	-0.14215	-0.03084
	9 - 10	-0.07693	0.03469	0.14631
***	10 - 7	-0.29439	-0.18469	-0.07499
***	10 - 8	-0.28684	-0.17684	-0.06684
	10 - 9	-0.14631	-0.03469	0.07693

(MSE = .0676679)

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
MCOMP24				
	8 - 7	-0.02850	0.08240	0.19329
	8 - 9	-0.01184	0.10101	0.21385
***	8 - 10	0.04588	0.15740	0.26892
	7 - 8	-0.19329	-0.08240	0.02850
	7 - 9	-0.09393	0.01861	0.13115
	7 - 10	-0.03620	0.07500	0.18621
	9 - 8	-0.21385	-0.10101	0.01184
	9 - 7	-0.13115	-0.01861	0.09393
	9 - 10	-0.05676	0.05639	0.16955
***	10 - 8	-0.26892	-0.15740	-0.04588
	10 - 7	-0.18621	-0.07500	0.03620
	10 - 9	-0.16955	-0.05639	0.05676
	(MSE = .0695451)			
MCOMP28				
	9 - 8	-0.04604	0.06573	0.17750
	9 - 10	-0.00400	0.10809	0.22017
***	9 - 7	0.07171	0.18318	0.29465
	8 - 9	-0.17750	-0.06573	0.04604
	8 - 10	-0.06811	0.04235	0.15281
***	8 - 7	0.00761	0.11745	0.22729
	10 - 9	-0.22017	-0.10809	0.00400
	10 - 8	-0.15281	-0.04235	0.06811
	10 - 7	-0.03506	0.07510	0.18525
***	7 - 9	-0.29465	-0.18318	-0.07171
***	7 - 8	-0.22729	-0.11745	-0.00761
	7 - 10	-0.18525	-0.07510	0.03506
	(MSE = .0682294)			

Table 16, Mathematics Post Hoc Contrasts by Grade - Continued

MCOMP29	Grade Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
	9 - 10	-0.08504	0.02911	0.14325
	9 - 8	-0.07252	0.04131	0.15514
***	9 - 7	0.01113	0.12466	0.23818
	10 - 9	-0.14325	-0.02911	0.08504
	10 - 8	-0.10029	0.01220	0.12469
	10 - 7	-0.01663	0.09555	0.20773
	8 - 9	-0.15514	-0.04131	0.07252
	8 - 10	-0.12469	-0.01220	0.10029
	8 - 7	-0.02851	0.08335	0.19521
***	7 - 9	-0.23818	-0.12466	-0.01113
	7 - 10	-0.20773	-0.09555	0.01663
	7 - 8	-0.19521	-0.08335	0.02851

(MSE = .0707658)

* Alpha = 0.05; Confidence = 0.95; Df = 274; T = 1.62405
Comparisons significant at the 0.05 level are indicated by "***".

Table 17

Post Hoc Contrasts for Transformed Mathematics Competencies by Levels of Typerec

MCOMP1

Scheffe' Grouping	Mean	N	Typerec
A	0.64	165	1
B	0.50	186	2

MSE=0.068 LSD=0.055

MCOMP2

Scheffe' Grouping	Mean	N	Typerec
A	0.82	165	1
B	0.74	186	2

MSE=0.034 LSD=0.039

MCOMP7

Scheffe' Grouping	Mean	N	Typerec
A	0.79	165	1
B	0.74	186	2

MSE=0.040 LSD=0.042

MCOMP9

Scheffe Grouping	Mean	N	Typerec
A	0.75	165	1
B	0.68	186	2

MSE=0.053 LSD=0.048

MCOMP10

Scheffe' Grouping	Mean	N	Typerec
A	0.75	165	1
B	0.66	186	2

MSE=0.055 LSD=0.049

MCOMP11

Scheffe' Grouping	Mean	N	Typerec
A	0.75	165	1
B	0.67	186	2

MSE=0.050 LSD=0.050

MCOMP12

Scheffe' Grouping	Mean	N	Typerec
A	0.64	165	1
B	0.56	186	2

MSE=0.071 LSD=0.056

MCOMP13

Scheffe' Grouping	Mean	N	Typerec
A	0.70	165	1
B	0.52	186	2

MSE=0.067 LSD=0.054

Table 17, Mathematics Post Hoc Contrasts by Typerec - Continued

MCOMP14

Scheffe' Grouping	Mean	N	Typerec
A	0.86	165	1
B	0.72	186	2

MSE=0.035 LSD=0.039

MCOMP15

Scheffe' Grouping	Mean	N	Typerec
A	0.89	165	1
B	0.75	186	2

MSE=0.027 LSD=0.035

MCOMP16

Scheffe' Grouping	Mean	N	Typerec
A	0.77	165	1
B	0.63	186	2

MSE=0.053 LSD=0.048

MCOMP17

Scheffe' Grouping	Mean	N	Typerec
A	0.75	165	1
B	0.59	186	2

MSE=0.060 LSD=0.052

MCOMP18

Scheffe' Grouping	Mean	N	Typerec
A	0.64	165	1
B	0.45	186	2

MSE=0.075 LSD=0.058

MCOMP19

Scheffe' Grouping	Mean	N	Typerec
A	0.81	165	1
B	0.70	186	2

MSE=0.039 LSD=0.041

MCOMP20

Scheffe' Grouping	Mean	N	Typerec
A	0.79	165	1
B	0.53	186	2

MSE=0.044 LSD=0.044

MCOMP21

Scheffe' Grouping	Mean	N	Typerec
A	0.80	165	1
B	0.66	186	2

MSE=0.047 LSD=0.045

Table 17, Mathematics Post Hoc Contrasts by Typerec - Continued

MCOMP22

Scheffe' Grouping	Mean	N	Typerec
A	0.73	165	1
B	0.61	186	2

MSE=0.055 LSD=0.049

MCOMP24

Scheffe' Grouping	Mean	N	Typerec
A	0.66	165	1
B	0.52	186	2

MSE=0.070 LSD=0.056

MCOMP25

Scheffe' Grouping	Mean	N	Typerec
A	0.60	165	1
B	0.47	186	2

MSE=0.070 LSD=0.056

MCOMP26

Scheffe' Grouping	Mean	N	Typerec
A	0.60	165	1
B	0.43	186	2

MSE=0.075 LSD=0.058

MCOMP29

Scheffe' Grouping	Mean	N	Typerec
A	0.63	165	1
B	0.52	186	2

MSE=0.071 LSD=0.056

* Alpha=0.05; Df=274; T=1.969;
Harmonic Mean of Cell Sizes=174.872
Means with the same letter are not significantly different.